ADWR Proposal: Water Information for Well Owners
April 12, 2007

Introduction

The Exempt Wells Subcommittee of the SWAG recently developed a proposal to collect hydrologic and water use information needed by prospective well owners within critical groundwater basins* and to disseminate the information to the well owners. As part of the proposal, a number of steps were suggested to collect and disseminate the information. The Department builds off the Subcommittee proposal and has outlined some alternative approaches to collecting and distributing the needed information, and has provided some rough estimates of staffing needs.

The Issue and Solution statement below come from the Wells Subcommittee paper and are used as the basis for the Department's proposal.

"Issue: Well owners make water supply decisions without the benefit of adequate information"

"Solution: Develop better hydrologic information for critical groundwater basins and provide that information to property owners applying for a well permit."

The following proposal has been broken into the two broad areas of information collection and analysis, and information dissemination.

Task I. Information Collection and Analysis

Data Collection

In order to provide well owners with an understanding of local hydrologic conditions affecting a potential well, information should be gathered, organized, and presented in layman's terms. Much of the hydrologic data suggested in the proposal exist, although perhaps not in the desired amounts or frequency. Water level and water level change maps or data exist for all basins, although only the AMA maps are updated every 5 years. Sources of existing hydrologic data and descriptions are the Water Atlas, the AMA Management Plans, ADWR Modeling Reports, the ADWR Hydrologic Map Series, and the ADWR website (www.azwater.gov) . The Atlas for example, contains a layman's description of each groundwater basin, water level and water level change maps, water quality data, perennial stream segments, and other information.

Other information suggested by the proposal would need to be collected with additional staff time requirements. Groundwater and surface water monitoring networks exist, but would need to be tailored and probably expanded to provide sufficient detail for the purpose of the proposal. Costs would vary by basin and by level of detail. Small basins

without an extensive network of wells take four staff for one week to measure, plus an equivalent amount of office time to arrange appointments. Large basins, such as the Phoenix AMA, take about four weeks for a dozen staff. The Department contracts with the US Geological Survey to operate surface water gages. Our cost is about $7,000 per gage per year, plus an initial $7,000 to install the gage. The proposal calls for five year updates of the information. Of the list of basins provided by the Subcommittee, only the AMA and the Upper San Pedro are updated on a 5 year basis.

Groundwater Models

The proposal also suggests groundwater models be developed. Groundwater models developed for regional analysis rarely offer sufficient detail to help site individual wells. They are useful as a broad planning tool and to look at future regional trends in groundwater levels and in water level flow directions, and may also be useful in predicting the effects of groundwater withdrawals on perennial and intermittent streams. The effects of individual well are usually too small to see in a regional model however and are not recommended for the purpose of this proposal.

Water Use Data

Gathering water use information for individual wells can be attempted in several ways. One is through the use of meters for two years periods, as the Exempt Wells Subcommittee suggests. This requires purchase, installation and later removal of the meter, and may require maintenance as well.

Another approach is to use non- invasive flow meters to determine discharge rates and relate the discharge rate to either the poser consumption by the well or to the length of time that the well is operating. The Department has non-invasive equipment to measure well discharge. The Department developed factors to use with power records in the early 1980s when the requirement to meter large wells in the AMAs was being implemented. While not as accurate as installing meters, this approach may be cheaper and easier to implement. While the Department has needed equipment, staff use it to measure well discharges only a few times a year, and additional staff would be needed to conduct basin-wide efforts.

The Department's water management staff may also conduct limited surveys of water use by individual well owners to determine how water is used and thus how much is pumped. In addition, analysis of the Department's well registration database can provide information on typical well size, depth, and initial pumping capacity. This information is useful in planning the drilling and construction of new wells.

Surface Water Data

Surface water information related to well use and groundwater/surface water interaction is available from several sources. The US Geological Survey maintains a network of streamgages across the State in cooperation with the Department and many other

agencies, and published the data on-line and in paper format. Wells in areas subject to the Adjudication proceeding may or may not be pumping subflow or affecting surface water flow. While this is an issue ultimately to be settled by the Adjudication Court, well owners can be made aware of the issue as part of this proposal and can locate their prospective well relative to intermittent and perennial streams and associated subflow zones. This can be accomplished by making available the maps of intermittent and perennial streams published by the Arizona Game and Fish Department.

Analysis of Data

Hydrologic information must be analyzed and organized for presentation. In some cases it will be sufficient to refer the well owner to the source of the information, especially if the information is readily available on the internet or the Department's web site. In other cases however, the data will need to be analyzed to extract information of use to the well owner. The data analysis would require preparation of water level maps and water level change maps, aquifer descriptions, and explanation of the effects of wells on the aquifer, on nearby wells, and on nearby streams. It would also require that nearby wells be mapped to show proximity to new wells. An interactive map that would allow the well owner to turn layers of information on and off and to print the resulting map would be useful. This would require the use of an ArcIMS application developed by GIS staff and offered through the internet. An alternative would be to approach the Arizona Water Institute to provide this tool, since they have currently developed a similar application using the Department's databases.

Reports on each basin specific to well owner concerns will need to be prepared if not available, although to the extent possible the Department would refer well owners to existing reports or other sources of information. Preparation of specific reports will require efforts from hydrology, GIS, and water management staff. The reports would contain an overview of the groundwater basin, discussion of the groundwater system and past and current water levels and changes in water level, water quality concerns, and any special concerns such as groundwater/surface water interactions, growth rates, or high decline rates. Reports should also summarize information on the types of wells existing in the basin, their locations, and should provide information to help the owner understand groundwater conditions that may affect his well in the future, such as decline rate changes.

Task II. Disseminate Data to Prospective Well Owners

The Subcommittee proposal suggests that much of the information be presented using a GIS approach, which would be very efficient. It isn't clear if the approach suggested is meant to be interactive. If the well owner were to enter a location through the internet and receive back maps and information specific to his location, an ArcIMS application would need to be developed.

The Department has developed several IMS applications but they require substantial investment of staff time. Development of a GIS approach specific to each basin but not interactive would be faster. As noted above, an alternative to having the Department develop such an application is to approach the Arizona Water Institute with the task. Development of a system as suggested in the Subcommittee proposal would include the ability to provide information of the proposed well location and to see an on-line map showing water levels, depth to water, change in depth to water, nearby streams, nearby large-capacity wells, and other information.

Reports describing aquifer characteristics, effects of well pumping on water levels and nearby wells, common well construction characteristics, or how to set a pump level and allow for future water level declines would require re-organization of existing information, as well as some analysis of Department databases, but would be relatively straightforward. Work would be performed by Department hydrology, GIS, water management, and planning staff.

Providing educational material on groundwater and surface water rights, on the Adjudication, and other subjects is also straightforward, and would only also require re-organization of information largely already available on our website. Work would be performed by Department hydrology, GIS, water management, and planning staff.

Summary of Information to be Gathered and Provided to Well Owners

The table below summarizes the type of information to be collected, the sources of the information, and the agency or group tasked with the work.

Information Type	Sources	Collection, Analysis and Organization
Water Level Data and Maps	ADWR GWSI databases; ADWR Monitoring efforts	ADWR Hydro/GIS staff
Hydrologic Mapping	ADWR, USGS, AzGS, AG&F	ADWR; AWI
Water Level Change Data and Maps	ADWR GWSI databases; ADWR Monitoring efforts	ADWR Hydro/GIS staff
Water Quality Data	ADWR and ADEQ databases and reports	ADWR and ADEQ staff
Surface Water Conditions	USGS data; AZ G&F streamflow maps; AZGS geologic maps	ADWR Hydro, GIS and Planning staff
Local Well Information	ADWR Wells 55 Database	ADWR Planning staff
Water Use by Wells	Published reports, limited non-invasive monitoring	ADWR Hydro, WM, and Planning staff
Basin Hydrology Report	Water Atlas, other reports, specific report written for well owners	ADWR Hydro/WM/Planning staff
Groundwater System Description	ADWR Reports - Water Atlas, Hydrologic Map Series, other, USGS reports and fact sheets,	ADWR Hydro and Planning staff
Groundwater Models (not generally recommended for this proposal)	ADWR; USGS	ADWR; USGS

Staffing and Costs

The Subcommittee proposal notes that additional staff would be required to develop and administer the program. Even if limiting the proposal to the use of existing material, to organize the information according to the needs of the program, and publish a stand-alone paper would require staff tine. Use of an ArcIMS approach to offer information on the internet as suggested would require additional GIS and Information Technology staff support. Providing the information discussed by the proposal would require the services of hydrology, water management, GIS and planning staff resources planner. It is premature to estimate how long it would take to develop the needed material until more decisions are made about the level of detail needed.

ADWR Recommendation

The Department recommends that we meet with the Exempt Well Subcommittee to refine the proposal to address such questions as:

- Web-based or not web-based?
- Frequency of groundwater monitoring
- Level of detail provided for critical basins
- Site specific basin reports or reliance on other information, such as the Water Atlas
- Any additional information requirements needing changes to the Groundwater Code

Answering these questions will then allow us to better address staffing and equipment costs needed to implement the proposal.

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*The list of basins provided within the Exempt Wells Subcommittee proposal differs slightly from the Critical Basin list under development by the Department.

Exempt Wells Subcommittee Groundwater Basins
Upper San Pedro River Basin
Verde River Basin (Including Prescott AMA)
Mohave County
Santa Cruz AMA
Sulphur Springs Valley

ADWR Critical Basins

Detrital
Hualapai
Sacramento
Upper San Pedro
Verde
Wilcox
Pinal AMA